COSEWIC
Assessment and Status Report

on the

Fascicled Ironweed
Vernonia fasciculata

in Canada

ENDANGERED
2014

COSEWIC
Committee on the Status
of Endangered Wildlife
in Canada

COSEPAC
Comité sur la situation
des espèces en péril
au Canada

COSEWIC status reports are working documents used in assigning the status of wildlife species suspected of being at risk. This report may be cited as follows:

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Fascicled Ironweed — Photo provided by author.

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COSEWIC
Assessment Summary

Assessment Summary – November 2014

Common name
Fascicled Ironweed

Scientific name
Vernonia fasciculata

Status
Endangered

Reason for designation
This showy perennial plant has a restricted geographical range in Canada, and occupies small prairie remnants mainly along roadside ditches and riversides in southern Manitoba. The few small subpopulations are at risk from such threats as flood duration/frequency alteration, cultivation, ranching, herbicide use, and road and right-of-way maintenance activities.

Occurrence
Manitoba

Status history
Designated Endangered in November 2014.

COSEWIC
Executive Summary

Fascicled Ironweed
Vernonia fasciculata

Wildlife Species Description and Significance

Fascicled Ironweed is an erect perennial herb with smooth to slightly hairy stems that grow up to two metres tall and support sharply toothed stalkless leaves with conspicuous pits on the underside. The inflorescence is a flat, dense cluster of flower heads composed of purple disc florets. The seed-like fruits called "cypselae" have a crown of elongate bristles and are adapted for wind dispersal.

The species has been used for ornamental plantings, and some cultural and medicinal uses have been reported.

Distribution

The extant Canadian range of Fascicled Ironweed is confined to a small area in south eastern Manitoba. Its North American range extends south through much of the central United States.

Habitat

Fascicled Ironweed is typically found in moist to wet prairies and riparian areas. It does not tolerate deep shade. In Manitoba it is found in roadside ditches and open to semi-open riparian areas.

Biology

Fascicled Ironweed is a perennial species which flowers one to two years after germination. Flowers are visited by bees, flies, and butterflies. Seeds are adapted for wind dispersal but may also be dispersed by flowing water. This species can survive seasonal flooding and is generally avoided by mammalian grazers.

Subpopulation Sizes and Trends

There are three known subpopulations in Canada, two of which have fewer than 100 plants each (one has only five plants). There are thousands of plants in the largest subpopulation; the number of plants is coarsely estimated to be 21,000. Overall trends are difficult to assess given the lack of consistent monitoring, though the abundance of at least one subpopulation has decreased in the past decade. Two historical subpopulations in Morris, MB and Weyburn, SK are believed to be extirpated.

Threats and Limiting Factors

Roadside subpopulations are threatened by road and ditch maintenance activities. Riparian plants are threatened by alteration of flood duration and frequency, and cultivation.

Protection, Status, and Ranks

Fascicled Ironweed was assessed by COSEWIC as Endangered in November 2014. . In Manitoba, it has been listed as Endangered under the *Endangered Species and Ecosystems Act*.

The NatureServe global rank of Fascicled Ironweed is G5 (Secure); the national rank in Canada is N1 (Critically Imperilled). Subnational ranks are S1 (Critically Imperilled) in Manitoba and SH (Possibly Extirpated) in Saskatchewan.

TECHNICAL SUMMARY

Vernonia fasciculata

Fascicled Ironweed — Vernonie fasciculée

Range of occurrence in Canada (province/territory/ocean): MB, SK (extirpated)

Demographic Information

Generation time. Fascicled Ironweed is a perennial with flowers typically appearing one to two years after germination. Individual plants can persist significantly longer.	Unknown, but possibly 2-5 yrs
Is there an [observed, inferred, or projected] continuing decline in number of mature individuals?	Unknown
Estimated percent of continuing decline in total number of mature individuals within [5 years or 2 generations]	Unknown
[Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over the last [10 years, or 3 generations]. While declines have been noted in the ditch sub-populations, these declines represent a very small percentage of the total number of plants in Manitoba (the vast majority being along the Rat River).	Unknown
[Projected or suspected] percent [reduction or increase] in total number of mature individuals over the next [10 years, or 3 generations].	Unknown
[Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over any [10 years, or 3 generations] period, over a time period including both the past and the future.	Unknown
Are the causes of the decline clearly reversible and understood and ceased?	N/A
Are there extreme fluctuations in number of mature individuals?	No

Extent and Occupancy Information

Estimated extent of occurrence	338 km²
Index of area of occupancy (IAO)	60 km²
Is the population severely fragmented?	No
Number of locations	3
Is there an [observed, inferred, or projected] continuing decline in extent of occurrence? There is a projected continuing decline with the loss of the Lowe farm and as continuing when including the loss of the subpopulation west of Morris.	Yes

Is there an [observed, inferred, or projected] continuing decline in index of area of occupancy? An observed decline– subpopulation 1 mile (1.6 km) west of Morris has been extirpated. There is a projected continuing decline with the loss of the Lowe farm.	Yes
Is there an [observed, inferred, or projected] continuing decline in number of subpopulations? An observed decline – subpopulation 1 mile (1.6 km) west of Morris has been extirpated. There is a projected continuing decline with the loss of the Lowe farm.	Yes
Is there an [observed, inferred, or projected] continuing decline in number of locations*? An observed decline – subpopulation 1 mile (1.6 km) west of Morris has been extirpated. There is a projected continuing decline with the loss of the Lowe farm.	Yes
Is there an [observed, inferred, or projected] continuing decline in [area, extent and/or quality] of habitat? An observed decline in extent (cultivation of pasture near Lowe Farm, ditch excavation near Lowe Farm, ditch mowing along PR 200, areas of cattle trampling along Rat River).	Yes
Are there extreme fluctuations in number of (sub)populations?	No
Are there extreme fluctuations in number of locations?	No
Are there extreme fluctuations in extent of occurrence?	No
Are there extreme fluctuations in index of area of occupancy?	No

Number of Mature Individuals (in each subpopulation)

Subpopulation	**N Mature Individuals**
PR 200 – ditch (2010)	~54
Lowe Farm – ditch & drain (2013)	5
Rat River – riparian area (surveys between 2006 & 2013)	~21,000
Total	~21,000

Quantitative Analysis

Probability of extinction in the wild is at least [20% within 20 years or 5 generations, or 10% within 100 years].	Not done

Threats (actual or imminent, to subpopulations or habitats)

Flood duration/frequency alteration, cultivation, ranching, herbicide use, road and right-of-way maintenance activities

Rescue Effect (immigration from outside Canada)

Status of outside population(s)?	Historical in SK. Common in southern portions of North Dakota and Minnesota.
Is immigration known or possible?	Possible
Would immigrants be adapted to survive in Canada?	Yes
Is there sufficient habitat for immigrants in Canada?	Yes?
Is rescue from outside populations likely?	unknown

Data Sensitive Species

Is this a data sensitive species?	No.

Status History

COSEWIC: Designated Endangered in November 2014.

Status and Reasons for Designation:

Status:	**Alpha-numeric code:**
Endangered	B1ab(i,ii,iii,iv)+2ab(i,ii,iii,iv)
Reasons for designation: This showy perennial plant has a restricted geographical range in Canada, and occupies small prairie remnants mainly along roadside ditches and riversides in southern Manitoba. The few small subpopulations are at risk from such threats as flood duration/frequency alteration, cultivation, ranching, herbicide use, and road and right-of-way maintenance activities.	

Applicability of Criteria

Criterion A (Decline in Total Number of Mature Individuals): Not applicable. The extent of decline is unknown.
Criterion B (Small Distribution Range and Decline or Fluctuation): Meets Endangered B1ab(i,ii,iii,iv)+2ab(i,ii,iii,iv) with 3 locations and a continuing decline in EO, IAO, quality of habitat, and number of subpopulations..
Criterion C (Small and Declining Number of Mature Individuals): Not applicable. The population size exceeds thresholds.
Criterion D (Very Small or Restricted population): Not applicable. The population size exceeds thresholds for D1 and the future rate of decline may be insufficient to meet D2.
Criterion E (Quantitative Analysis): Not done.

COSEWIC HISTORY

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) was created in 1977 as a result of a recommendation at the Federal-Provincial Wildlife Conference held in 1976. It arose from the need for a single, official, scientifically sound, national listing of wildlife species at risk. In 1978, COSEWIC designated its first species and produced its first list of Canadian species at risk. Species designated at meetings of the full committee are added to the list. On June 5, 2003, the *Species at Risk Act* (SARA) was proclaimed. SARA establishes COSEWIC as an advisory body ensuring that species will continue to be assessed under a rigorous and independent scientific process.

COSEWIC MANDATE

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assesses the national status of wild species, subspecies, varieties, or other designatable units that are considered to be at risk in Canada. Designations are made on native species for the following taxonomic groups: mammals, birds, reptiles, amphibians, fishes, arthropods, molluscs, vascular plants, mosses, and lichens.

COSEWIC MEMBERSHIP

COSEWIC comprises members from each provincial and territorial government wildlife agency, four federal entities (Canadian Wildlife Service, Parks Canada Agency, Department of Fisheries and Oceans, and the Federal Biodiversity Information Partnership, chaired by the Canadian Museum of Nature), three non-government science members and the co-chairs of the species specialist subcommittees and the Aboriginal Traditional Knowledge subcommittee. The Committee meets to consider status reports on candidate species.

DEFINITIONS
(2014)

Wildlife Species	A species, subspecies, variety, or geographically or genetically distinct population of animal, plant or other organism, other than a bacterium or virus, that is wild by nature and is either native to Canada or has extended its range into Canada without human intervention and has been present in Canada for at least 50 years.
Extinct (X)	A wildlife species that no longer exists.
Extirpated (XT)	A wildlife species no longer existing in the wild in Canada, but occurring elsewhere.
Endangered (E)	A wildlife species facing imminent extirpation or extinction.
Threatened (T)	A wildlife species likely to become endangered if limiting factors are not reversed.
Special Concern (SC)*	A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.
Not at Risk (NAR)**	A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.
Data Deficient (DD)***	A category that applies when the available information is insufficient (a) to resolve a species' eligibility for assessment or (b) to permit an assessment of the species' risk of extinction.

* Formerly described as "Vulnerable" from 1990 to 1999, or "Rare" prior to 1990.

** Formerly described as "Not In Any Category", or "No Designation Required."

*** Formerly described as "Indeterminate" from 1994 to 1999 or "ISIBD" (insufficient scientific information on which to base a designation) prior to 1994. Definition of the (DD) category revised in 2006.

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Canada

The Canadian Wildlife Service, Environment Canada, provides full administrative and financial support to the COSEWIC Secretariat.

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WILDLIFE SPECIES DESCRIPTION AND SIGNIFICANCE

Name and Classification

Scientific Name: *Vernonia fasciculata* Michx.

Synonyms: *V. fasciculata* ssp. *corymbosa* (Schwein. ex Keating) S.B. Jones; *V. fasciculata* var. *corymbosa* (Schwein. ex Keating) Daniels, *V. fasciculata* var. *corymbosa* (Shweinitz) B.G. Schubert

Common Name: Fascicled Ironweed, Western Ironweed, Prairie Ironweed

Family: Asteraceae (Aster Family)

Seventeen species of the genus *Vernonia* occur in North America (Strother 2006), only three of which occur in Canada: *V. fasciculata* Michx., *V. gigantea* (Walt.) Trel., and *V. missurica* Raf. (Brouillet *et al.* 2010+; NatureServe 2012).

Morphological Description

Fascicled Ironweed is an erect perennial herb with smooth to slightly hairy stems that grow up to two metres tall and support sharply toothed stalkless leaves with conspicuous pits on the underside. There are usually multiple stems per plant (MBCDC unpubl.; see **Abundance**). The 4-10 cm wide inflorescence is a flat, dense cluster of flower heads composed of purple disc florets (see cover image), though one plant was found with white flowers (MBCDC unpubl.). The seed-like fruits called "cypselae") have a crown of elongate bristles and are adapted for wind dispersal having pappus bristles 5-7+ mm long (Strother 2006). For detailed descriptions see Gleason and Cronquist (1991) and Strother (2006).

Population Spatial Structure and Variability

The chromosome number of Fascicled Ironweed is 2n=34 (Strother 2006). There is likely little genetic differentiation between the Canadian population and subpopulations to the south given the proximity to occurrences in North Dakota and Minnesota and the potential for seeds to travel considerable distances via wind (Kartesz 2011), or downstream by the flowing water of rivers near where the plants occur.

Fascicled Ironweed is known to hybridize with other members of the genus, but no other *Vernonia* species overlap with the Canadian range of *V. fasciculata* (Strother 2006; Tropicos.org 2009; MBCDC unpublished data).

Designatable Units

This report recognizes a single designatable unit (DU). Scoggan (1979) assigns all Canadian material to *Vernonia fasciculata* var. *corymbosa* (Schwein.) Schub. The Flora of North America (Strother 2006) does not recognize any subspecific taxa for Fascicled Ironweed. All Canadian occurrences are within the Prairie Ecozone.

As per COSEWIC (2010) guidelines (Guideline #2), subpopulations established for commercial and ornamental purposes are not included in the assessment as there is no intention that these subpopulations will contribute to the wild population.

Special Significance

This species is commercially available in Manitoba and elsewhere for ornamental plantings and has been used in prairie restorations in the U.S. (Baer *et al.* 2004; Prairie Originals 2009; McCain *et al.* 2011). It is unknown if this species has been used in any restorations within the natural range of the species in Manitoba (Morgan pers. comm. 2013) or Saskatchewan.

Medicinal and cultural use by Aboriginal groups in North America has been noted (Hutchens 1973; Jackson 2000) and some medicinal properties of the species have been studied (Borchardt *et al.* 2008). Swanson *et al.* (1979) examined Fascicled Ironweed's potential as a source of natural rubber.

Ecologically, this species signifies the presence of ecosystems that have dramatically decreased since European settlement: moist prairies and river bottom forests. It is regularly visited by bees and butterflies for nectar, and may be an important resource for these species especially in a landscape dominated by intensive agriculture (Robertson 1899; Foster and Reimer 2007; MBCDC unpublished data).

DISTRIBUTION

Global Range

The extant global range of Fascicled Ironweed is the tallgrass prairies of the midwestern and eastern United States, and southern part of Manitoba in Canada (Figure 1; Kartesz 2011; NatureServe 2012; White 2012). Adventive (i.e., not native) subpopulations occur in New York, Massachusetts, and Rhode Island (Kartesz 2011). The occurrences in southern Manitoba are the most northerly known occurrences of this species.

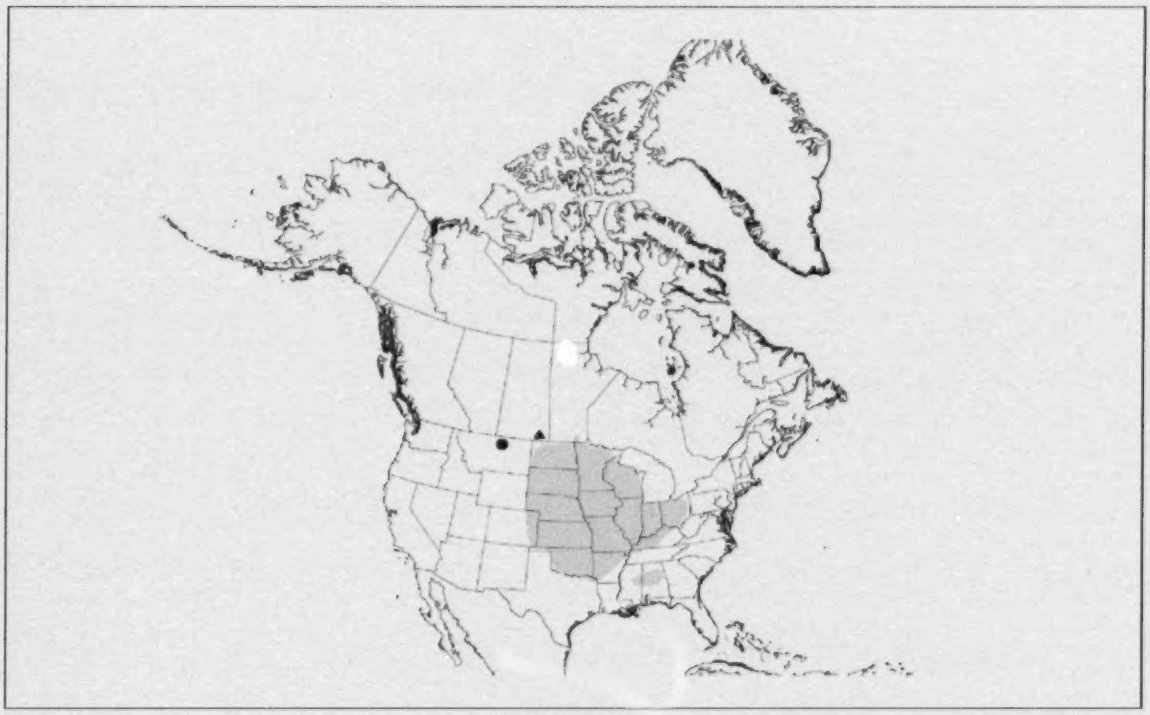

Figure 1. Distribution map of Fascicled Ironweed (*Vernonia fasciculata*). Filled circle indicates a disjunct population; filled triangle indicates an historical population. Background map courtesy of COSEWIC.

Canadian Range

The historical range of Fascicled Ironweed in Canada extended from Weyburn in southern Saskatchewan (Scoggan 1979) to Morris and Otterburne in southern Manitoba (Murray and Friesen 2012). This species is now considered historical (extirpated) in Saskatchewan (Enns pers. comm. 2012; Harms pers. comm. 2014) (see **Search Effort** for more information). Its presence in Saskatchewan is based on specimens collected at Weyburn and housed at the New York Botanical Garden. Boivin's 1966 annotation of this undated specimen suggests the location on the specimen label data is doubtful given the distance between Weyburn and other known occurrences. However, the identification of the specimen appears accurate based on the report writers' examination of a photograph of the specimen (available at http://sweetgum.nybg.org/vh/specimen.php?irn=941130) and Harms (2006) includes the species in his list of Saskatchewan vascular plants, so this report assumes the specimen was indeed collected at Weyburn.

All known historical records of this species in Manitoba are from the Morris and Otterburne areas (Table 1) (Scoggan 1957, 1979; Löve and Bernard 1959; Foster and Reimer 2007; Beaulieu-Bouchard pers. comm. 2012). Surveys by staff from the Manitoba Conservation Data Centre between 2006 and 2013 have confirmed three extant subpopulations: along approximately 45 km of the Rat River from St. Pierre-Jolys to approximately 3 km from where the Rat River empties into the Red River; in ditches along PR 200 just south of the Rat River; and in a municipal drain several miles west of Morris near Lowe Farm. The vast majority of plants occur along the Rat River (Figure 2; MBCDC unpubl.). No introduced self-sustaining subpopulations are known (see **Special Significance**).

Table 1. Historical Canadian collections of Fascicled Ironweed (*Vernonia fasciculata*).

Herbarium	Collector(s)	Collection No.	Collection Date	Locality	Habitat
CAN	Macoun	2314	1896-08-08	Morris, Manitoba	Along the Scratching [Morris] River
MT	Fr. Jean-Paul Bernard	50/229	1950-08-25	Provencher District. Otterburne, en bordure de la rivière aux Rats ("Along the Rats River")	En bordure du rivage d'une rivière (Along the shore of a river)
MT, S, WIN, CAN	Homer J. Scoggan	11577	1953-08-09	Morris, 1 mile west of town	Single large clump in grassy ditch
DAO	J.P Bernard	53/360	1953-08-12	Provencher District. Otterburne, 1 mille a l'ouest ("1 mile west")	Rivage de la riviere aux Rats. (Shore of the Rat River.)
DAO	J.P Bernard	53/365	1953-08-12	Provencher District. Otterburne, 1 mille a l'ouest ("1 mile west")	Rivage de la riviere aux Rats. (Shore of the Rat River.)
S	Frere Jean-Paul Bernard	54/566	1954-08-17	Otterburne	rivages de la riviere aux Rats, pres de la propriete de la Maison St-Joseph (shores of the Rat River, near the property of Maison St. Joseph)
WIN	J-P. Bernard	54-569	1954-08-18	Provencher District. Otterburne	rivage de la riviere au Rats, a 1 mille a l'ouest du village (shore of the Rat River, 1 mile west of town)
DAO	J.P Bernard	5502	1956-08-09	Otterburne	Otterburne, pres du pont. Rivage de la riviere aux Rats. (Otterburne, near the bridge. Shore of the Rat River.)

Herbarium	Collector(s)	Collection No.	Collection Date	Locality	Habitat
MT, WIN, DAO, UBC	Bernard Boivin, Jean-M. Perron, Fr. Jean-Paul Bernard	12888	1958-08-14	Provencher District. Otterburne, le long de la rivière aux Rats ("along the Rat River")	Bois d'alluvions le long d'une rivière; une seule touffe; la plupart des individus étaient à inflorescence corymbiforme, quelques uns à inflorescence plus diffuse (Alluvial woods along a river, a single tuft, most individuals were corymbose inflorescence, some of the inflorescences more diffuse)
UBC	Bernard Boivin, J.P. Bernard, J.M. Perron	12888	1958-08-14	Otterburne	bois d'alluvions le long de la riviere aux rats (alluvial woods along the Rat River)
NY, DAO	N.B. Sanson	136		Weyburn, Saskatchewan; Weyburn Prairie, E. Sask.	

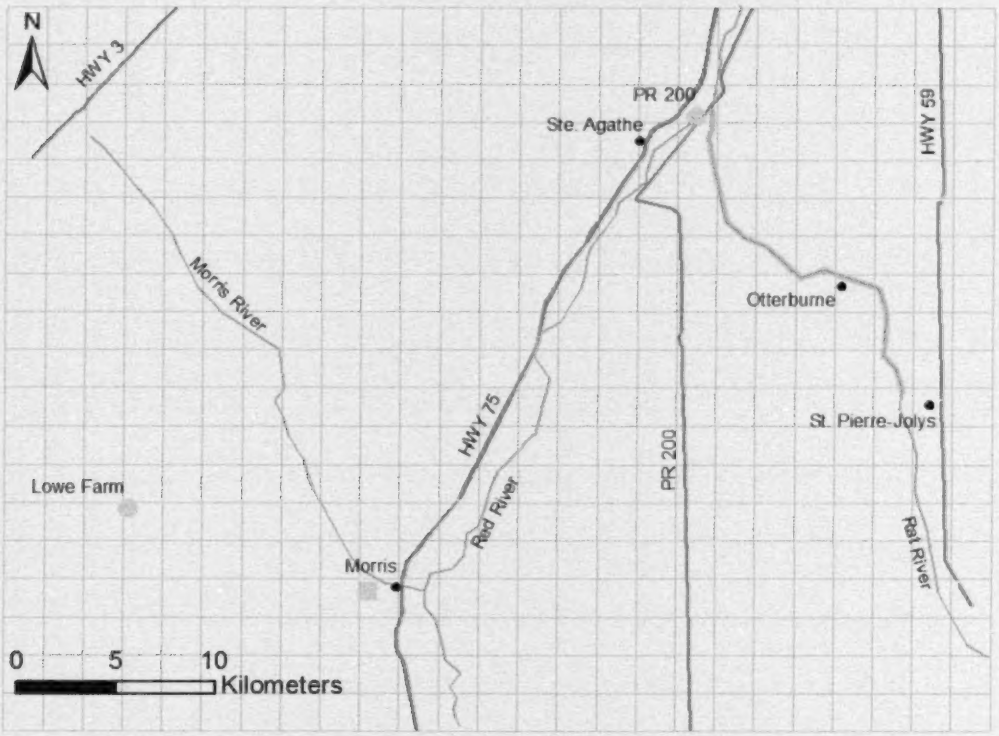

Figure 2. Canadian subpopulations of Fascicled Ironweed (*Vernonia fasciculata*) in Manitoba with a 2 km X 2 km grid. The green square indicates a historical subpopulation. Green circles and lines indicate extant subpopulations. (Credit: MBCDC).

Extent of Occurrence and Area of Occupancy

The extent of occurrence (EO) for this species in Canada was determined by use of computer GIS (Geographic Information System) software (Figure 2). Only extant subpopulations were included within a convex polygon; the historical Saskatchewan occurrence was not included as it is considered extirpated (see **Canadian Range** and **Search Effort**). The EO of Fascicled Ironweed in Canada is approximately 338 km^2. Based on a 2 km by 2 km grid the index of area of occupancy (IAO) is 60 km^2. The true EO and IAO may be somewhat larger because as-yet unsurveyed portions of the Rat River likely support some additional plants. However, given the paucity of historical records and the negative search results in other areas, it is unlikely that the EO and IAO will increase substantially with additional search effort.

Search Effort

Between 2006 and 2013, 16 person days have been dedicated to Fascicled Ironweed surveys in the Otterburne and Morris area by staff of the Manitoba Conservation Data Centre. Approximately 45 km of the lower Rat River (between St. Pierre-Jolys and the Red River) has been surveyed. The last 12 km of the Morris River and the last 1 km of Shannon Creek (empties into the Morris River near Morris) were searched but no Ironweed was observed (Friesen and Murray 2011). A number of road allowances west of Morris were searched but no Ironweed was observed (MBCDC unpubl.). The observer of a sighting of this species along the Red River at Ste. Agathe in the early 1990s (reported in Foster and Reimer 2007) now considers the locality of the sighting to be in error, with the correct locality being along the Rat River (MBCDC unpubl.). Surveys along the Red River at Ste. Agathe in 2006 did not detect any Fascicled Ironweed and noted the habitat as unsuitable (Foster and Reimer 2007).

Nature Conservancy of Canada staff have conducted dedicated surveys in the Rat River Swamp (4 person days) and general riparian vegetation surveys along portions of the La Salle River, Joubert Creek (a tributary of the Rat River), and the old Roseau River channel (approximately 205 person days) during the typical flowering period of Ironweed, but it was not found (Hamel pers. comm. 2012). Despite vegetation surveys over many years, this species has not been found at Manitoba's Tall Grass Prairie Preserve, which is approximately 32 km southeast of St. Pierre-Jolys and adjacent to the south edge of the Rat River Swamp. It should be noted, however, that despite their proximity to Ironweed occurrences, many of these areas are in the Interlake Plain ecoregion rather than the Lake Manitoba Plain ecoregion in which Ironweed occurs.

Potential habitat that remains to be searched for Ironweed includes riparian areas along those portions of the Red, Roseau, and Marsh rivers that are within the Lake Manitoba ecoregion.

Potentially suitable habitat, including riparian areas and moist meadows, in southeastern Saskatchewan have been the subject of botanical surveys over many years. The Souris River valley has been the subject of numerous surveys over several decades by John Hudson, Vernon Harms, and others (Harms pers. comm. 2014). Botanical surveys have been conducted in community pastures around Weyburn and Estevan (the Coalfields, Lomond, and Estevan-Cambria pastures), which included areas of moist meadows (Godwin pers. comm. 2014). Fascicled Ironweed was not identified in any of these surveys.

HABITAT

Habitat Requirements

All Canadian subpopulations of Fascicled Ironweed are confined to the Prairie Ecozone. The Manitoba populations are in the Lake Manitoba Plain Ecoregion, while the historical occurrence in Saskatchewan is in the Moist Mixed Grassland Ecoregion. Mean annual precipitation ranges from 419 mm in Weyburn to 541 mm in southeastern Manitoba (Environment Canada 2012). Across its range, this species typically inhabits bottomlands, ditches, and low prairies (Strother 2006).

In Manitoba, the extant occurrences are confined to ditches and open to semi-open riparian habitats that are regularly flooded (Foster and Reimer 2007; Friesen and Murray 2011; Murray and Friesen 2012). In semi-open riparian areas in which Fascicled Ironweed is found, the canopy is typically composed of deciduous tree species, including Green Ash (*Fraxinus pennsylvanica*), American Elm (*Ulmus americanus*), Manitoba Maple (*Acer negundo*) and Eastern Cottonwood (*Populus deltoides*) (MBCDC unpubl.). The shrub layer is typically sparse to absent, while the herbaceous layer ranges from very sparse to dense. Many of these areas are subject to seasonal flooding. Fascicled Ironweed typically occurs within 40 m of the river (Friesen and Murray 2011; Murray and Friesen 2012).

Along the Rat River, open areas that support Fascicled Ironweed are often areas where agricultural development occurs very near the river, with Ironweed growing in the relatively narrow, often disturbed, areas between the agricultural development and the river. These areas often support many weedy species, including non-native species. In some cases, Fascicled Ironweed can be a dominant species in such areas (Figure 3). Introduced grasses dominate the ditches in which Fascicled Ironweed has been found.

This species typically grows in moist to wet soils (Foster and Reimer 2007; Friesen and Murray 2011; Murray and Friesen 2012). Dry conditions seem to reduce growth and seed production (Froelich pers. comm. 2012; Morgan pers. comm. 2012).

Figure 3. Fascicled Ironweed (*Vernonia fasciculata*) growing near the Rat River in Manitoba. (photo credit: MBCDC).

Habitat Trends

It is unclear how abundant and widespread Ironweed was before European settlement. While it may have always been rare in Manitoba where it is at the northern edge of its range, habitat conversion due to agricultural activities and other development has very likely further restricted the distribution of the species. The subpopulation reported from a cattle pasture near Lowe Farm was nearly extirpated when the pasture was converted to cropland – the remaining plants were confined to a ditch and a drain adjacent to the property (Foster and Reimer 2007; Friesen and Murray 2011). In 2013, no plants were found in the ditch portion of the population as the ditch had been cleared of vegetation for faster drainage (MBCDC unpubl.). In 2013, one ditch along PR 200 had been mowed, so no plants were observed in that portion of ditch. Several areas along the Rat River may also be subject to agricultural disturbance (e.g., cultivation, herbicide use) as the species does occur along field margins (Friesen and Murray 2011).

The habitat of the two ditch subpopulations – near Lowe Farm and along PR 200 - is unlikely to improve, and will likely decline. These areas are surrounded by agricultural fields and managed for transportation and drainage concerns, which may not align with the ecological requirements of the species.

BIOLOGY

Very little basic biological or ecological research regarding Fascicled Ironweed was found, thus much of the information below comes from observations during field surveys and inferences from plant morphology and habitat characteristics.

Life Cycle and Reproduction

Fascicled Ironweed is a perennial with flowers typically appearing one to two years after germination (Froelich pers. comm. 2013; Morgan pers. comm. 2013); no information was found regarding longevity. This suggests that generation time is at least two years, but insufficient demographic information is available for a formal calculation. In Manitoba, Fascicled Ironweed flowers in August and September and flowers are likely pollinated by insects such as bees, butterflies, and flies (Foster and Reimer 2007; Morgan pers. comm. 2012) and may be self-compatible (Baye and Becker 2008) but are unlikely apomictic (Noyes 2007). Flowers are bisexual (Barkley *et al.* 2006). Seed production is reduced in dry years (Froelich pers. comm. 2012; Morgan pers. comm. 2012).

The seeds are adapted for wind dispersal, but may also be carried by flowing water. Seed germination rates are low (Shaw and Schmidt 2003), though commercial seed producers have achieved germination rates of approximately 40% after cold stratification, with seeds uncovered and air temperature >20°C (Froelich pers. comm. 2012; Morgan pers. comm. 2012). Vegetative reproduction can occur via rhizomes and the species can spread aggressively (Shaw and Schmidt 2003), but this was not observed in Manitoba nursery subpopulations (Morgan pers. comm. 2012). No information is available regarding rhizome length, longevity, or the number of stems produced per rhizome.

Physiology and Adaptability

Fascicled Ironweed is adapted to seasonal water inundation and the resulting build-up of silt (Shaw and Schmidt 2003; Sluis and Tandarich 2004; Foster and Reimer 2007). In Manitoba, Fascicled Ironweed grows on the banks and floodplain of the Rat River (Friesen and Murray 2011, 2012). Water levels on the Rat River usually peak in mid to late April, though flows can stay high well into May (Graveline *et al.* 2005), thus inundating many areas supporting Fascicled Ironweed for several weeks. Areas with low banks are likely flooded nearly every spring, while areas with higher banks are flooded less often (Friesen and Murray 2010; Friesen and Murray 2011; Murray and Friesen 2012). Years with high silt deposition may result in reduced seed germination as seeds are deeply buried; however, the ability to grow from and reproduce via rhizomes can allow for competitive advantage over less flood-tolerant species (Sluis and Tandarich 2004).

Dispersal and Migration

Seeds are adapted for wind dispersal (Strother 2006), with the potential for seeds to travel considerable distances via wind (Kartesz 2011). As Fascicled Ironweed inhabits riparian areas, it may be possible for seeds to disperse by floating on water, though this has not been confirmed.

Interspecific Interactions

Fascicled Ironweed is a source of nectar and pollen for bees and butterflies (Robertson 1899; Foster and Reimer 2007). It may also be visited by flies (Morgan pers. comm. 2012). Several aphid species use Fascicled Ironweed as a host (Williams 1891; Cook 1984).

The foliage of Fascicled Ironweed is bitter tasting and generally avoided by mammalian grazers (Hilty 2002-2012; Shaw and Schmidt 2003).

Fascicled Ironweed is not dependent on mycorrhizae and may in fact do better in areas with reduced mycorrhizal availability as growth of mycorrhizal-dependant competitors is limited (Wilson *et al.* 1997).

POPULATION SIZES AND TRENDS

Sampling Effort and Methods

The number of plants and/or stems in Manitoba's two small subpopulations have only been counted in 2010 and 2013. Very coarse visual estimates have been made for the largest subpopulation that occurs along the Rat River (surveys conducted via canoe). This subpopulation occurs for numerous kilometres along the banks of the Rat River on many parcels of private land – landowner contact and surveys on foot to determine more precise abundance estimates would be very time consuming compared to surveys via canoe. The focus of most surveys to date has been on determining distribution rather than abundance.

The areas around two reported subpopulations – 1) in a ditch one mile west of Morris (based on a herbarium specimen), and 2) at Ste. Agathe – have been surveyed in multiple years between 2006 and 2013, but no plants have been found (MBCDC unpubl.).

Abundance

Fascicled Ironweed plants in Manitoba have been recorded with between one and 11 stems (MBCDC unpubl.), though no data are available on the average number of stems per plant. In cases where only stem counts have been reported, the median number of stems recorded per plant (six) will be used to estimate the number of plants. Where this calculation is used, the stem count will appear first followed by the approximate number of plants in brackets.

The subpopulation near Lowe Farm consisted of five plants in 2013 (MBCDC unpubl.); in 2010 there were 62 stems (approx. 10 plants) (MBCDC unpubl.).

In 2010, the subpopulation in ditches along PR 200 consisted of approximately 325 stems (approx. 54 plants) (MBCDC unpubl.).

During surveys from 2009 to 2013, Fascicled Ironweed was regularly observed in the riparian area along a 45 km section of the Rat River (Friesen and Murray 2010, 2011; Murray and Friesen 2012; MBCDC unpubl.). Most often observers noted multiple plants in any given area. In each survey year, each of which covered a different stretch of river, several patches consisting of thousands of stems each (coarse visual estimation) were identified (MBCDC unpubl.) (see Figure 3). These patches were typically noted in areas that were either easily visible from within the canoe, or in the few areas where observers left the canoe and went up onto the river bank. It is very likely that more of such populous patches are present along the Rat River in areas not visible by observers in a canoe. Considering the number of patches consisting of 1,000 or more stems (sometimes many more than 1,000), plus the number of smaller patches, it does not seem unreasonable to coarsely estimate the number of stems along the Rat River to be 125,000 ± 25,000 (20,833 plants ± 4,167 plants). Given the lack of precise estimation of the number of plants, a relatively high uncertainty value (± 25,000 stems) was chosen. This assessment will use the rounded value of 21,000 as the estimated number of plants in the Rat River subpopulation, but this is a very coarse estimate.

Fluctuations and Trends

It is difficult to assess trends in population size as this species is infrequently observed and has not been consistently monitored. It is probable that the population has decreased as the range has presumably shrunk post-European settlement. However, Foster and Reimer (2007) suggested that the range/abundance of Fascicled Ironweed in Manitoba may have increased since the mid-1900s when it was described as being "only along the [Rat] river, and there rather rare" (Löve and Bernard 1959) near Otterburne. The increase was attributed to flooding along the Red and Rat rivers (Löve and Bernard 1959; Foster and Reimer 2007), though no additional evidence for such a phenomenon was found.

Because growth, and therefore conspicuousness, of Fascicled Ironweed can vary dramatically in relation to moisture availability (Froelich pers. comm. 2012; Morgan pers. comm. 2012), subpopulations may appear to fluctuate between dry and wet years, though the number of plants is in fact the same. Unless detailed surveys on foot are conducted, determining whether apparent changes in abundance are the result of actual changes in the number of mature individuals or simply variation in detection rates may not always be clear.

If apparent fluctuations do reflect changing numbers of mature individuals, they would still not qualify as 'extreme fluctuations' according to the IUCN (2013) criteria.

Much of the subpopulation along the Rat River has only been surveyed once and the historical distribution is unclear, so trend information is not available.

The subpopulation near Lowe Farm experienced considerable decline in size between 1995-2006 when a cattle pasture was converted to cropland - only several plants remained in an adjacent ditch and drain (Foster and Reimer 2007; Friesen and Murray 2011). The ditch has since been cleared of much vegetation, apparently including the Fascicled Ironweed, leaving only five plants associated with the drain (MBCDC unpubl.).

Trend information for the subpopulation along PR 200 is not available, though a ditch that supported plants in 2010 was mowed in 2013 (MBCDC unpubl.).

A specimen was collected in 1953 "in [a] grassy ditch 1 mile west of town [Morris]"; this area has been surveyed at least three times in the past decade and no plants have been found (Foster and Reimer 2007; Friesen and Murray 2011).

Rescue Effect

Fascicled Ironweed is common in the southern parts of Minnesota and North Dakota, and has been observed in several northern counties that border the Red River (Ruby pers. comm. 2013; Sather pers. comm. 2013; USDA 2013). Propagules may travel via wind and, possibly, water across the border into Manitoba, and would likely be adapted for survival in Manitoba.

There are roadside ditches that would likely be suitable for Fascicled Ironweed, though subpopulations in such areas would be subject to substantial threats (see Threats and Limiting Factors). There are some wet prairie areas near the known extent of Fascicled Ironweed in Manitoba, primarily the Manitoba Tall Grass Prairie Preserve. Most other wet prairie in southern Manitoba has been converted to agricultural fields. Some riparian habitat may also be available, though topographic maps and aerial imagery indicate many water courses in the area have been channelized or otherwise altered for faster drainage, or riparian areas have been cleared for agriculture or development (Manitoba Conservation and Water Stewardship unpubl.).

Rescue to Saskatchewan is possible assuming suitable habitat still exists there, but it is unlikely given the distance between Weyburn and known occurrences in North Dakota (at least 230 km).

THREATS AND LIMITING FACTORS

Threat Assessment

Threats were categorized and assessed using the threats calculator (Appendix 1) following the methods of Salafsky *et al.* (2008) and Master *et al.* (2009). The threats calculator indicates an overall threat impact of 'medium-low' (Appendix 1). The important threats are discussed below in order of threat impact score.

7 – Natural System Modification

Scope: Pervasive, Severity: Moderate-Slight, Impact: Medium-Low

7.2 – Dams & water management/use.

One major dam (St. Malo dam) occurs on the Rat River along with several smaller control structures (KGS Group 2001). The St. Malo dam, which is upstream of the known Fascicled Ironweed distribution, was completed in 1960 with the objectives of ensuring water supply for nearby communities and downstream agricultural users, though it now also supports recreational activities (MCWS 2014). Smaller dams have been constructed downstream of the St. Malo dam for stock-watering and irrigation purposes (MCWS 2014). Many kilometres of drains have been constructed in the watershed to facilitate agricultural land use by removing 'excess' surface water (MCWS 2014).

There are significant concerns regarding flood events in the Rat River watershed, particularly in areas upstream of the known distribution of Fascicled Ironweed (KGS 2001; MCWS 2014; SRRCD 2014). Given these concerns, there has been and continues to be considerable interest in flood control measures, including the construction of dykes, dams, and diversions along the Rat River (KGS 2001; MCWS 2014; SRRCD 2014).

As discussed earlier, Fascicled Ironweed is flood-tolerant and may gain a competitive advantage over less flood-tolerant species in riparian areas that flood regularly. Structures such as dams and diversions that reduce the flood frequency and/or duration along the Rat River could therefore reduce this advantage and result in a decline in habitat suitability. This could affect >99% of plants in Canada.

2 – Agriculture and Aquaculture

Scope: Restricted-Small, Severity: Moderate, Impact: Low

2.1 - Annual & perennial non-timber crops.

In some areas along the Rat River, Fascicled Ironweed occurs along the margins of agricultural fields (Figure 6). Plants in such areas are threatened by cultivation. The subpopulation west of Morris was eliminated by the conversion of native pasture to cropped field (Foster and Reimer 2007; Friesen and Murray 2011).

2.3 – Livestock farming & ranching.

Portions of the riparian zone along the Rat River are used as cattle pastures. In some of these areas, the riparian zone was nearly barren of vegetation due to grazing and trampling by cattle; Fascicled Ironweed was observed adjacent to such areas. Because cattle tend to avoid grazing Fascicled Ironweed (Hilty 2002-2012; Shaw and Schmidt 2003), its absence from such areas is likely due to trampling and other soil disturbance caused by cattle.

9 – Pollution

Scope: Restricted-Small, Severity: Moderate, Impact: Low

9.3 – Agricultural & forestry effluents.

In some areas along the Rat River, Fascicled Ironweed occurs along the margins of agricultural fields (Figure 4). Plants in such areas are threatened by the use of herbicides that may drift during application from the field to the Fascicled Ironweed plants.

Figure 4. Fascicled Ironweed (*Vernonia fasciculata*) growing on the margins of an agricultural field near the Rat River in Manitoba. (photo credit: MBCDC)

4 – Transportation and Service Corridors

Scope: Negligible, Severity: Extreme-Serious, Impact: Negligible

4.1 – Roads and railroads.

Two of the three extant subpopulations are in roadside ditches. Such ditches are subject to right-of-way maintenance activities including herbicide application, mowing, and ditch deepening and widening (Foster and Reimer 2007). Herbicide application or ditch work could eliminate all plants in either of these subpopulations. Roadsides may be important vectors of movement for Fascicled Ironweed where other habitat has been lost. Road reconstruction also threatens these subpopulations.

Several roads cross the Rat River in areas where Fascicled Ironweed grows. Maintenance and eventual reconstruction of these crossings threaten plants growing near such areas.

1 – Residential and Commercial Development

The threat of development was considered to be negligible because, despite its severity, the scope is very limited. Aside from a golf course that borders the Rat River in the range of Fascicled Ironweed, development was very limited in riparian areas.

8.1 Invasive Non-native/Alien Species

Weedy non-native species often co-occur with Fascicled Ironweed, sometimes in considerable numbers and densities. This is likely the result of the preference of both Fascicled Ironweed and the non-native species for disturbed habitats. Fascicled Ironweed appears quite able to co-exist with other weedy species as these are the habitats in which it is usually found, and hence non-native species were not considered a threat.

Number of Locations

This report identifies three subpopulations: 1) the ditch along Provincial Road (PR) 200, 2) the ditch and drain near Lowe Farm, and 3) the banks of the Rat River.

The number of locations is primarily determined by the most serious and plausible threat(s) (COSEWIC 2012). This assessment identifies Natural System Modification as the threat with the highest impact score (medium-low) (Appendix 1). The Rat River subpopulation is defined as one location because it is subject to alteration of flood duration and frequency..

The two ditch subpopulations are not subject to the Natural System Modification threat discussed above, so a different threat must be used to define additional locations (COSEWIC 2012); in this case, the most serious and plausible threat to the ditch subpopulations is Transportation and Service Corridors. The impact score of this threat is 'Negligible' (Appendix 1), though this reflects the impact on the entire Canadian population – the impact of this threat on these two subpopulations would be much greater. Because these two subpopulations are 1) separated by approximately 35 km, 2) managed by different agencies (one by the province of Manitoba and one by the Rural Municipality of Morris), and 3) very unlikely to both be impacted by a single event (e.g., road work at one location), they are defined as two separate locations.

PROTECTION, STATUS AND RANKS

Legal Protection and Status

Fascicled Ironweed was assessed by COSEWIC as Endangered in November 2014. .

In Manitoba and Ohio, Fascicled Ironweed is listed as Endangered under the *Endangered Species and Ecosystems Act* and the *Ohio Administrative Code - Division of Endangered Species*, respectively.

Non-Legal Status and Ranks

The NatureServe global rank of Fascicled Ironweed is G5 (Secure, last reviewed 1996); the national rank in Canada is N1 (Critically Imperilled) and the United States is N5? (Secure?) (NatureServe 2012). Subnational ranks are S1 (Critically Imperilled) in Manitoba, SH (Possibly Extirpated) in Saskatchewan, S2 (Imperilled) in Ohio, S5 (Secure) in Iowa, and SNR (not assessed/ranked) in the fifteen other states in which it occurs (NatureServe 2012).

The 2010 General Status ranks for this species are 0.1 (Extirpated) for Saskatchewan and 2 (May Be At Risk) for Manitoba and Canada (CESCC 2011).

Habitat Protection and Ownership

Except for subpopulations in roadside ditches, virtually the entire area occupied by Fascicled Ironweed in Manitoba is privately owned.

Private conservation organizations are active within the range of Fascicled Ironweed, offering conservation easements and other programs to private landowners. However, no easements along the Rat River are known to include this species; the nearest easement along the Rat River is approximately 30 km upstream (south) of the known distribution of Fascicled Ironweed (Hamel pers. comm. 2013).

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BIOGRAPHICAL SUMMARY OF REPORT WRITER(S)

The Manitoba Conservation Data Centre (MCDC) is the storehouse of information on Manitoba's biodiversity. Several field teams have collected data on Ironweed in the last decade. Those primarily responsible for producing this report include Chris Friesen, Colin Murray, and Nicole Firlotte. Chris Friesen obtained a graduate degree in Botany from the University of Manitoba and has since worked at the MCDC conducting field surveys and managing the biodiversity database. Colin Murray has a biology degree from the University of Winnipeg and worked as an environmental consultant for several years before joining the MCDC. Nicole Firlotte earned a graduate degree in Botany from the University of Manitoba before joining the MCDC, where she is responsible for its overall operation.

COLLECTIONS EXAMINED

Information was obtained from the following collections: CAN (Canadian Museum of Nature), DAO (Agriculture and Agri-Food Canada), MMMN (Manitoba Museum), MT (Université de Montréal), NY (New York Botanical Garden), QFA (Université Laval), S (Swedish Museum of Natural History), and WIN (University of Manitoba).

Appendix 1. Threat classification and impact calculation results for Fascicled Ironweed.

Note: Threats Calculator worksheet data can be made available upon request from the COSEWIC Secretariat.